REMARKS

Claims 1-10, 12-17, 19-20 and 22-23 remain in this application. Claims 11, 18 and 21 have been cancelled. Claims 1, 8, 9, 15 and 20 have been amended. Claims 1, 9, 15 and 20 are independent claims.

In an Office action dated April 26, 2005, claims 1-2, 9-10, 12 and 15 were rejected under 35 U.S.C. 102(e) as allegedly being anticipated by Takada. Claims 20-23 were rejected under 35 U.S.C. 103(a) as being unpatentable over Pham et al. Additionally, claims 3-5, 8, 11, 13 and 16-19 were rejected under Section 103(a) over Takada in view of Pham et al., with claims 6, 7 and 14 being rejected further in view of Marquez et al.

In response, Applicants have amended the claims to more clearly distinguish the claims from the cited prior art. Reconsideration of the claims is requested.

A. Patentability of Claims 1 and 15

Claims 1 and 15 were rejected under Section 102(e) as allegedly being anticipated by Takada. Fig. 1 of Takada was cited as teaching an optical link device enclosed in a housing that includes an alignment assembly having a light source 19 and lens 13. Takada also teaches an alignment stage having a single unit member 10 and an optical communications package 16. The single unit member 10 and the optical communications package 16 may be externally manipulable to align a light source and lens using image recognition of a circuit pattern or using image recognition of the light emitted from the light source. The single unit 10 and the optical communications package 16 are placed in contact with each other and fused together using heat irons 27.

In response to the rejection, Applicants have amended claim 1 to include subject matter from dependent claim 8, so as to describe an alignment stage coupled to enable adjustment of a relative position of a light source and a lens. The alignment stage is supported by thermally actuated members that enable the adjustment of the relative position of the light source and lens.

There is no teaching in Takada that adjustments made to the positioning of the photoconverter and condenser lens are enabled by thermally actuated members. Takada teaches that (col. 16, lines 4-17) a flat plate shaped heat iron is placed between the single unit 10 and optical

communications package 16. The single unit member 10 is placed in contact with or close to the heat iron, and a joint 10a and a joint 17c (thermally actuated members) are melted and placed in contact with each other to fuse the single unit member and the optical communications package. Alternative methods of fusing the single unit member to the optical communications package by the melting of joints 10a and 17c include using heat irons from the side, hot air, frequency induction heating, light irradiation, ultrasound or a melting agent. However, these techniques merely result in the fusing of the single unit member and the optical communications package. There is no teaching in Takada that joints 10a and 17c are utilized to enable adjustment of the position of the single unit member and optical communication package for the purpose of performing image recognition to align a light source and lens.

The Office action also asserted that it would have been obvious to modify Takada in view of Pham to teach alignment of optical components for optimal optical transmission. Pham teaches (Paragraph [0032]) that an opto-electronic micropackage is placed within a substantially uniform magnetic field and floated upon a heated liquified pool of solder. A current i_1, i_2 is applied to actuator wires 62, 63. This generates forces F_1, F_2 on the actuator wires. Because current i_1 is oriented directly opposite of current i_2, the forces F_1 and F_2 have an opposite direction. Since the wires are attached at diagonally opposite corners, the forces act in concert to create a movement M about the perpendicular axis formed by the forces. This movement causes the boat to rotate and causes the die to move angularly with respect to the optical cable to correct for angular error at the interface.

In short, Pham describes electro-magnetically actuated members that provide an adjustment. On the other hand, Applicants' invention describes an alignment stage supported by thermally actuated members that enable an adjustment of relative position of a light source and a lens. Pham teaches an alignment stage supported by a heated liquified pool of solder. However, Pham does not teach that the heat required to liquify the pool of solder provides an adjustment to move the die angularly with respect to the optical cable, so as to correct for angular error at the interface. Therefore, even if Takada were modified in view of Pham, it would not teach Applicants' invention described by amended claim 1.

Pham teaches (Paragraph [0038]) that because solder undergoes some thermal expansion, the positioning of the boat may change as the solder pool solidifies. This is a known quantity which is considered in the adjustment routine. The changes in position of the boat due to thermal

expansion (actuation) are not adjustments that correct for angular error or adjustments that move the boat and aperture into better alignment with the fiber optic light source (Fig. 9). They contribute to the angular error and must be compensated for <u>during</u> alignment. Pham teaches that alignment of the boat to correct for angular error at the interface or aperture and fiber optic light source is accomplished via electrostatic forces. Moreover, Applicants respectfully point out that amended claim 1 describes the thermally actuated members and the meltable material as being different elements of the claimed alignment assembly. Therefore, it is asserted that the combination of Takada and Pham does not teach the use of thermally actuated members for purposes of providing a relative position of a light source and lens as described by Applicants' amended claim 1.

Claim 15 has been amended to incorporate the subject matter of dependent claim 18, which described forming a plurality of patterned layers on at least one substrate so as to define a cooperative assembly that includes <u>at least one thermal actuator that is manipulated by applications of thermal actuator signals</u> to provide <u>said adjustment to said relative position of said light source and said lens</u>. Remarks made in support of independent claim 1, as currently amended, can be applied in support of claim 15.

As previously remarked, Takada teaches that support members of a single unit member and support members of an optical communications package are melted and pressed together <u>to fuse</u> the single unit member and the optical communications package together. Takada does not teach that the heating required to melt the support members or the force used to press together the support members is used to provide adjustment of a relative positioning of a light source and lens. Pham teaches utilizing electrostatic actuators that are manipulated by applications of electrostatic signals to provide adjustments of a light source and a lens. Thermal actuation, as taught by Pham, on the pool of solder is to enable the electrostatic adjustments but <u>do not provide</u> the adjustment.

Pham teaches that, due to thermal expansion, changes in boat positioning occur as the solder pool solidifies. However, these changes contribute to the angular error and must be compensated for during alignment, and as such are not adjustments in alignment.

Applicants respectfully assert that a material difference exists between Applicants' invention and the cited primary reference Takada. It is further asserted that even if Takada were modified in view of Pham, it would not teach an alignment stage coupled to enable adjustment of a relative

position of a light source and lens in which thermally actuated members provide the adjustment of the relative position of a light source and lens. Reconsideration of claims 1 and 15 is requested.

B. Patentability of Claim 9

Claim 9 was rejected under 35 U.S.C. 102(e) as allegedly being anticipated by Takada. In response, Applicants have amended independent claim 9 to further distinguish the claimed invention from the prior art. The subject matter of dependent claim 11 and additional features were incorporated into independent claim 9. Specifically, the locking mechanism is described to include (a) a heater, (b) solder, and (c) a source of electrostatic force, the support members of the alignment assembly having a cantilevered portion responsive to the electrostatic force to move in a direction generally aligned with the axis of the beam so as to bring the cantilevered portion into contact with said solder, said heater being located and activated to selectively melt said solder. Support resides in Paragraph [0042] of the specification as originally filed wherein, after the alignment stage has been properly positioned, the electrode 132 is used to generate electrostatic forces on the actuator 150, drawing the cantilevered end of the actuator into contact with the meltable material 140.

Takada teaches (col. 16, lines 4-18) that when the single unit member 10 and optical communications package 16 are brought in contact or close to heat iron 26, support members 15 and 17 (Fig. 1) are melted and pressed together to form joints 10a and 17c. The joints 10a and 17c form a locking mechanism that disables the varying of an alignment assembly to achieve a relative positioning of a light source and lens. However, Takada does not teach that a solder be applied to the support members 15 and 17 to form joints 10a and 17c. Takada teaches (col. 17, lines 32-44) that a hot melt adhesive be applied, melted and when brought together forms joints 10a and 17c. When cooled, the single unit member and optical communications package are joined.

Nor does Takada teach that support members 15 and 17 have a cantilevered portion. Even if the support members 15 and 17 of Takada were considered to be cantilevered or to have a cantilevered portion, there is no teaching that the force used to press together support members 15 and 17 to form joints 10a and 17c is an electrostatic force.

The secondary reference Pham teaches (paragraph [0010]) that a heated pool of solder may act as a locking mechanism to disable an alignment assembly from varying a relative positioning when the solder is cooled. Pham also teaches that the entire opto-electronic microcircuit package, including the solder pool, is placed in a magnetic field. However, there is no teaching that the solder pool is formed to have a cantilevered portion or that the magnetic field applied to the pool is used to place the package in contact with the solder. Pham (Paragraph [0025]) teaches the boat is metalized to form electrical bonding pads 35, 36, and to form edge connections 37 to the solder pool. Pham further teaches that forces F_1 and F_2 (paragraph [0032]) generated as a result of electric current i_1, i_2 being applied to actuator wires 62, 63 act in concert to rotate the boat. The rotation or angular movement, in turn, causes the die to move angularly with respect to the optical cable. The electrostatic forces are utilized to <u>make adjustments to correct for angular error, not to bring the boat into contact with the pool of solder</u>.

It is respectfully asserted that it would not be obvious to modify Takada in view of Pham. Even if a pool of solder could be formed on support members 15 and 17 of Takada, in order for electrostatic forces to successfully be used to draw the support members together, it would be necessary for the single unit member 10 and optical communications package 16 to be made of a material that was responsive to electrostatic forces, namely, a metal or metal alloy. Takada teaches (col. 5, lines 56-61) since expensive metal materials that allow for high precision machining <u>are not used</u> for the single unit member or the optical communications package, a wider choice of materials may be used, and manufacturing costs are reduced. It is submitted that Takada teaches away from forming the single unit member and optical communications package of a metal or a metal alloy.

It is asserted that the prior art references, whether taken alone or in combination, do not teach a locking mechanism which includes <u>support members of an alignment assembly having a cantilevered portion responsive to electrostatic forces to move in a direction generally aligned with a beam so as to bring the cantilevered portion into contact with a solder</u>, as described in the currently amended claim 9. It is therefore asserted that independent claim 9 is materially different from the prior art reference Takada.

It is respectfully asserted that amended claim 9 and its dependent claims are in an allowable condition and reconsideration is requested.

C. Patentability of Claim 20

The Office action rejected claim 20 under 35 U.S.C. 103(a) as allegedly being unpatentable over Pham. Pham was cited as teaching a method of providing optical alignment within an optics module which allegedly discloses all the features set forth in Applicants' claim 20.

In response, Applicants have amended independent claim 20 by incorporating the subject matter of dependent claim 21 and by describing an additional feature in order to distinguish the invention from the prior art. The currently amended claim 20 describes providing a fusible structure which permanently disables lateral movement of the alignment stage following the cooling step, the permanent disabling of the lateral movement occurring when the fusible structure is opened.

Support for the amendment can be found in Paragraph [0031] of the specification as originally filed, wherein the locking mechanism may include structure for permanently disabling the ability of the alignment stage to be moved after the alignment procedure has been completed. In Fig. 4, the flexure 90 may be electrically and mechanically "opened" by applying current across the contacts 108 and 110. That is, the flexure may be broken in the same manner as a fuse.

Pham teaches (Paragraph [0010]) an opto-electronic microcircuit mounted upon a substrate or boat, which in turn is mounted within a cavity of the package upon a pool of reflowable solder. When the solder is liquified, the entire package is placed in a magnetic field and current run through the actuator wires to force rotation of the boat. The current is adjusted to obtain the proper moment on the boat to move it into alignment with an impinging optical cable. Once in alignment, the solder is cooled to lock the boat in place and in alignment. Therefore, as noted on page 5 of the Office action, the fusible link is the solder pool itself when cooled. There is no teaching that the solder pool is opened when cooled and disables adjustment of the boat. Paragraph [0035] teaches that the solder pool is allowed to cool and solidify, suggesting a single unitary mass to lock the boat in place.

In Paragraph [0031], Pham teaches that edge trace 37 extends down the side of the boat and electrically interconnects with the underside metalization of the boat which contacts the solder pool, which connects to the conductive tank, which in turn connects to the upper surface of the package cavity floor. A drain line 45 electrically connects to the floor to a drain pad 46 on feed through 26 of the package. Even if edge trace 37 and drain line 45

were considered fusible structures, there is no teaching in Pham that the current applied to the actuators that rotate the boat may also be used to open those fusible structures after the solder cools.

Paragraph [0035] of Pham describes the steps of the method portrayed in Fig. 10. At step 104, the signal is measured for loss. If the results of the testing at step 105 are unacceptable, current is increased through the actuator wires at step 106 and another measurement is taken. This feedback loop continues until the test reveals an acceptable loss (105) and the solder pool is allowed to solidify (108). At step 109, the current is turned off. There is no teaching that the current be increased (or any other approach is taken) to open a fusible structure to permanently disable lateral movement of an alignment step after the solder has solidified.

In addition, it is asserted that it would not be obvious to modify Pham to include a step of increasing the current after the solder cools in order to create an opening in either the edge trace or drain line. Pham (Paragraph [0036]) teaches that those skilled in the art will readily appreciate that care must be taken that the above method does not exceed certain parameter ranges, such as a maximum current. Only by exceeding a maximum current could the edge trace or drain line be opened. Therefore, it is asserted that Pham teaches away from increasing current until an opening in a fusible structure is achieved.

Referring to Marquez, which teaches permanently disabling alignment of an optical fiber (Paragraph [0028]) when the fiber 12 is brought down so that the molten solder can wet the metalized portion of the fiber, the fiber is actively aligned and then moved a calculated distance to compensate for movement of the fiber during solder cooling. The voltage potential is removed and the solder cools and solidifies, bringing the fiber into precise optical alignment. The solidified solder may be considered a fusible structure. However, it is a fusible structure that has become united (solidified) about the optical fiber not opened as described by Applicants' currently amended claim 20.

Marquez also teaches (Fig. 3) a heater substrate that includes a substrate base 40 and conductive region 44 which defines electrodes 50. A series of resistive elements 52 are patterned on the conductive region. When voltage or current is applied to the electrodes, the resistive elements heat up, and heat is transferred to the solder platform to cause the solder preform to melt. However, none of the elements taught by Fig. 3 may be considered analogous to a fusible structure that disables lateral movement of an

alignment stage when opened. Marquez makes it clear that the purpose of the various elements of the heater substrate is merely to provide a platform (central region 42) for solder preform 32 and melting of the solder. Their function does not include permanently disabling adjustments to the optical fiber by opening one of the elements.

Furthermore, Marquez teaches (Paragraph [0025]) that the voltage or current potential can be any suitable voltage or current potential that provides the proper heating of the solder preform without adversely affecting other components of the assembly. It is submitted that utilizing a voltage or current to open any of the elements of the heater substrate to permanently disable adjustment of a fiber would be an unwanted adverse effect. It is asserted that Marquez teaches away from Applicants' amended claim 20. There would be no motivation to modify Pham in view of Marquez, because there would be no reasonable expectation of success. It is further asserted that independent claim 20, as amended, is materially different over the prior art references of Pham and Marquez, whether taken alone or in combination. Therefore, it is respectfully asserted that amended independent claim 20 and its dependent claims are in an allowable condition and reconsideration is requested.

Applicants respectfully request reconsideration of the claims in view of the amendments and remarks made herein. A notice of allowance is earnestly solicited. In the case that any issues regarding this application can be resolved expeditiously via a telephone conversation, Applicants invite the Examiner to call Terry McHugh at (650) 969-8458.

Respectfully submitted,

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